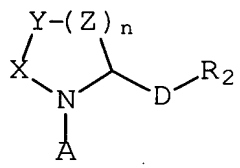
WHAT IS CLAIMED IS:

1. A compound of formula (I):



(I)

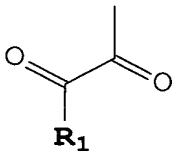
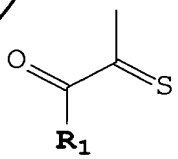
where

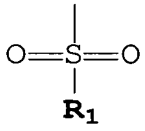
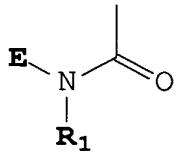
X, Y, and Z are independently selected from the group consisting of C, O, S, or N, provided that X, Y, and Z are not all C;

n is 1-3;

A is selected from the group consisting of L_1, L_2, L_3, or L_4,

where

L_1 is  , L_2 is  ,

L_3 is  , and L_4 is  ,

R_1 and E are independently selected from the group consisting of hydrogen, C_1-C_9 straight or branched chain alkyl or alkenyl, C_2-C_9 straight or branched chain alkenyl, aryl, heteroaryl, carbocycle, and heterocycle;

D is selected from the group consisting of a bond, C_1-C_{10} straight or branched chain alkyl, ethylene, and butylene;

R_2 is a carboxylic acid or a carboxylic acid isostere;

wherein said alkyl, alkenyl, alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or carboxylic acid isostere is optionally substituted with one or more substituents selected from R^3, where

R^3 is hydrogen, hydroxy, halo, haloalkyl, thiocarbonyl, alkoxy, alkenoxy, alkylaryloxy, aryloxy, arylalkyloxy, cyano,

nitro, imino, alkylamino, aminoalkyl, sulfhydryl, thioalkyl, alkylthio, sulfonyl, C_1-C_6 straight or branched chain alkyl, C_2-C_6 straight or branched chain alkenyl or alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or CO_2R^4 where R^4 is hydrogen or C_1-C_9 straight or branched chain alkyl or alkenyl;

or a pharmaceutically acceptable salt, ester, or solvate thereof;

provided that:

R_1 is not substituted with both hydroxy and oxygen to form carboxy, or R_1 is not substituted with both alkoxy and oxygen to form alkoxycarbonyl, or R_1 is not substituted with both amine and oxygen to form amide;

further provided that:

when A is L_1 or L_2, and D is a bond,

then R_2 is not COOH, or an amide;

further provided that:

when A is L_1, and R_1 is methyl, and D is a bond,

then R_2 is not COOH;

further provided that:

when A is L_3, and R_1 is phenyl, methylphenyl, phenylmethyl, substituted or unsubstituted phenoxyphenyl, substituted naphthyl, or methoxyphenyl, and D is a bond,

then R_2 is not COOH or an amide;

further provided that:

when A is L_3, and R_1 is phenyl, and D is a bond,

then R_2 is not thiophenyl;

further provided that:

when A is L_3, and R_1 is phenyl, and D is oxyethyl,

then R_2 is not an amide;

further provided that:

when A is L_3, and R_1 is substituted isoquinoline, and D is butyl,

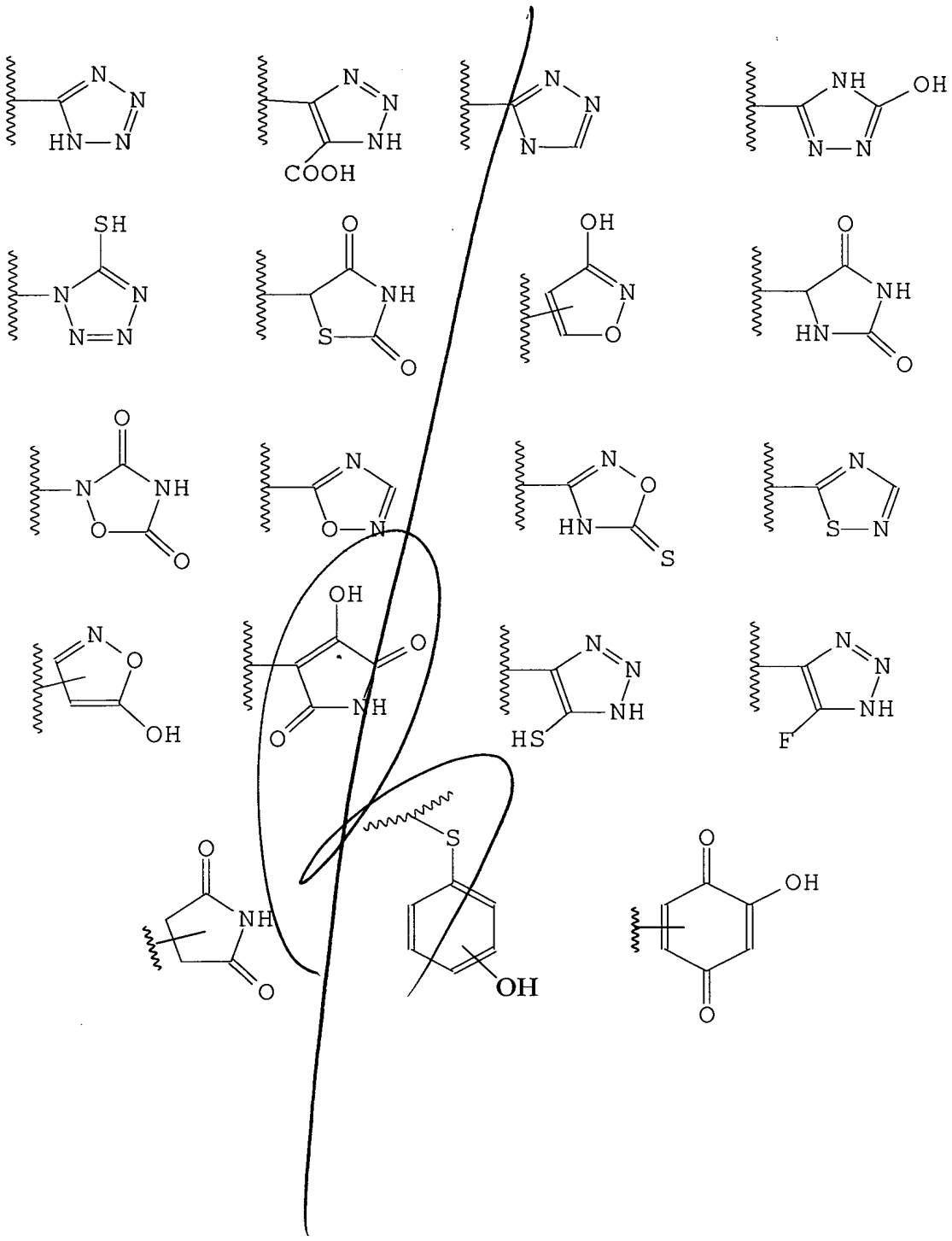
then R_1 is not an amide;

further provided that:

when A is L_3 or L_4, and R_1 is unsubstituted or substituted phenyl, and D is C_1-C_3 alkyl or alkenyl,
then R_2 is not COOH, OH, or an amide;
further provided that:
when A is L_4, and R_1 is phenyl, halo-substituted phenyl, dimethylphenyl, substituted butyl, or methylphenyl, and D is a bond,
then R_2 is not COOH;
further provided that:
when A is L_4, and R_1 is cyano-substituted alkyl, and D is a bond,
then R_2 is not an amide.

2. The compound of claim 1, wherein the carboxylic acid isostere of R_2 is a carbocycle or heterocycle containing any combination of CH_2, O, S, or N in any chemically stable oxidation state, wherein any of the atoms of said ring structure are optionally substituted in one or more positions with R^3.

3. The compound of claim 1, wherein R_2 is selected from the following group:



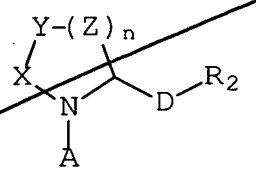
where the atoms of said ring structure may be optionally substituted at one or more positions with R^3.

4. The compound of claim 1, wherein the carboxylic acid or carboxylic acid isostere of R_2 is selected from the group consisting of:
$-COOH$, $-SO_3H$, $-SO_2HNR^3$, $-PO_2(R^3)_2$, $-CN$, $-PO_3(R^3)_2$, $-OR^3$, $-SR^3$, $-NHCOR^3$, $-N(R^3)_2$, $-CON(R^3)_2$, $-CONH(O)R^3$, $-CONHNHSO_2R^3$, $-COHNSO_2R^3$, and $-CONR^3CN$.

5. The compounds, (2S)-1-(phenylmethyl) carbamoyl-2-hydroxymethyl (4-thiazolidine); (2S)-1-(1,1-dimethylpropyl)carbamoyl-2-(4-thiazolidine)tetrazole; (2S)-1-(phenylmethyl) carbamoyl-2-(4-thiazolidine) carbonitrile; (2S)-1-(1,1-dimethylpropyl)carbamoyl-2-(4-thiazolidine)tetrazole; 3-(3,3-dimethyl-2-oxopentanoyl)-1,3-oxazolidine-4-carboxylic acid; and (2S)-1-(3,3-dimethyl 1,2-dioxopropyl)-2-(3-thiazolidine)carboxylic acid..

6. A pharmaceutical composition, comprising:
a) an effective amount of a carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring; and
b) a pharmaceutically acceptable carrier.

7. The pharmaceutical composition of claim 6, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring comprises a compound of formula (I):



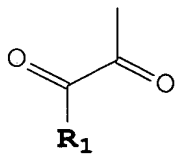
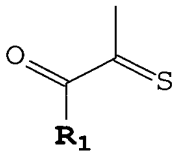
(I)

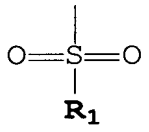
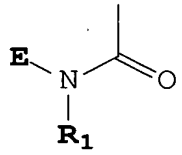
where
X, Y, and Z are independently selected from the group

consisting of C, O, S, or N, provided that X, Y, and Z are not all C;

n is 1-3;

A is selected from the group consisting of L_1, L_2, L_3, or L_4, where

L_1 is  , L_2 is  ,

L_3 is  , and L_4 is  ,

R_1 and E are independently selected from the group consisting of hydrogen, C_1-C_9 straight or branched chain alkyl or alkenyl, C_2-C_9 straight or branched chain alkenyl, aryl, heteroaryl, carbocycle, and heterocycle;

D is selected from the group consisting of a bond, C_1-C_{10} straight or branched chain alkyl, ethylene, and butylene;

R_2 is a carboxylic acid or a carboxylic acid isostere;

wherein said alkyl, alkenyl, alkynyl, aryl, heteroaryl, carbocycle, or heterocycle is optionally substituted with one or more substituents selected from R^3, where

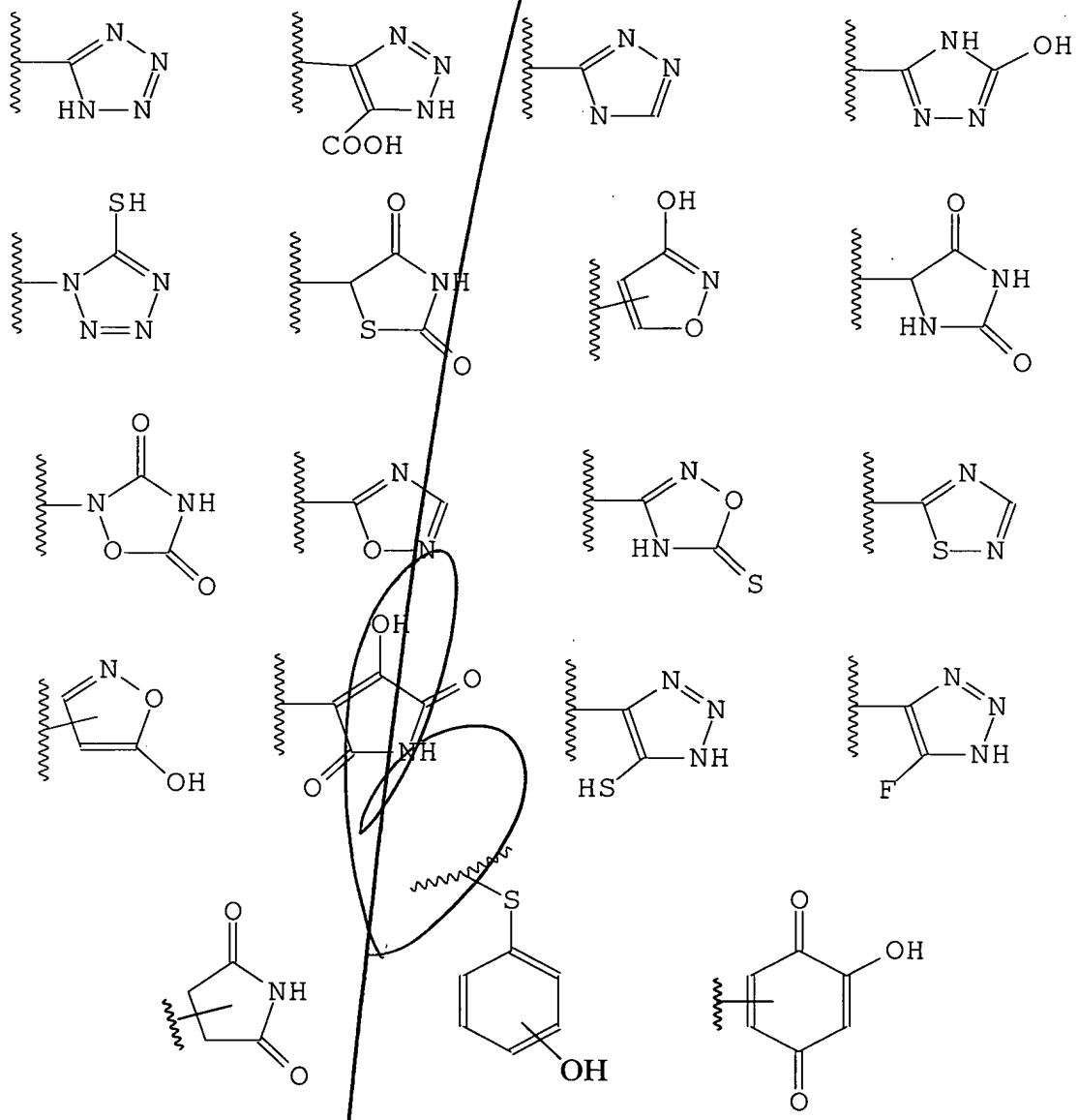
R^3 is hydrogen, hydroxy, halo, haloalkyl, thiocarbonyl, alkoxy, alkenoxy, alkylaryloxy, aryloxy, arylalkyloxy, cyano, nitro, imino, alkylamino, aminoalkyl, sulfhydryl, thioalkyl, alkylthio, sulfonyl, C_1-C_6 straight or branched chain alkyl, C_2-C_6 straight or branched chain alkenyl or alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or CO_2R^4 where R^4 is hydrogen or C_1-C_9 straight or branched chain alkyl or alkenyl;

or a pharmaceutically acceptable salt, ester, or solvate thereof.

8. The pharmaceutical composition of claim 7, wherein R_2

is a carbocycle or heterocycle containing any combination of CH_2, O, S, or N in any chemically stable oxidation state, wherein any of the atoms of said ring structure are optionally substituted in one or more positions with R^3.

9. The pharmaceutical composition of claim 7, wherein R_2 is selected from the following group:



where the atoms of said ring structure may be optionally substituted at one or more positions with R^3.

10. The pharmaceutical composition of claim 7, wherein R_2 is selected from the group consisting of:
$-COOH$, $-SO_3H$, $-SO_2HNR^3$, $-PO_2(R^3)_2$, $-CN$, $-PO_3(R^3)_2$, $-OR^3$, $-SR^3$, $-NHCOR^3$, $-N(R^3)_2$, $-CON(R^3)_2$, $-CONH(O)R^3$, $-CONHNHSO_2R^3$, $-COHNSO_2R^3$, and $-CONR^3CN$.

11. The pharmaceutical composition of claim 7, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is selected from the group consisting of compounds 1-442, compound L, and compound M.

12. The pharmaceutical composition of claim 6, further comprising a neurotrophic factor different from formula (I).

13. The pharmaceutical composition of claim 12, wherein said neurotrophic factor different from formula (I) is selected from neurotrophic growth factor, brain derived growth factor, glial derived growth factor, cilial neurotrophic factor, insulin growth factor and active truncated derivatives thereof, acidic fibroblast growth factor, basic fibroblast growth factor, platelet-derived growth factors, neurotropin-3 and neurotropin 4/5.

14. A method of treating a neurological disorder in an animal, comprising:

administering to the animal an effective amount of a carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring to stimulate growth of damaged peripheral nerves or to promote neuronal regeneration.

15. The method of claim 14, wherein the neurological disorder is selected from the group consisting of peripheral neuropathies cause by physical injury or disease state, physical damage to the brain, physical damage to the spinal cord, stroke associated with brain damage, and neurological disorders relating to neurodegeneration.

16. The method of claim 14, wherein the neurological disorder is selected from the group consisting of Alzheimer's Disease, Parkinson's Disease, and amyotrophic lateral sclerosis.

17. The method of claim 14, wherein the neurological disorder is Alzheimer's disease.

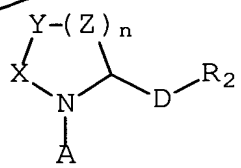
18. The method of claim 14, wherein the neurological disorder is Parkinson's disease.

19. The method of claim 14, wherein the neurological disorder is amyotrophic lateral sclerosis.

20. The method of claim 14, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is non-immunosuppressive.

Sub. A5

21. The method of claim 14, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring comprises a compound of formula (I):



(I)

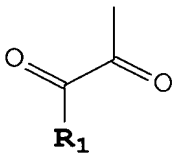
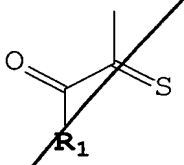
where

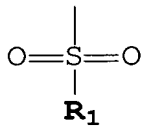
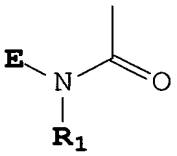
X, Y, and Z are independently selected from the group consisting of C, O, S, or N, provided that X, Y, and Z are not all C;

n is 1-3;

A is selected from the group consisting of L_1, L_2, L_3, or L_4,

where

L_1 is  , L_2 is  ,

L_3 is  , and L_4 is  ,

R_1 and E are independently selected from the group consisting of hydrogen, C_1-C_9 straight or branched chain alkyl or alkenyl, C_2-C_9 straight or branched chain alkenyl, aryl, heteroaryl, carbocycle, and heterocycle;

D is selected from the group consisting of a bond, C_1-C_{10} straight or branched chain alkyl, ethylene, and butylene;

R_2 is a carboxylic acid or a carboxylic acid isostere;

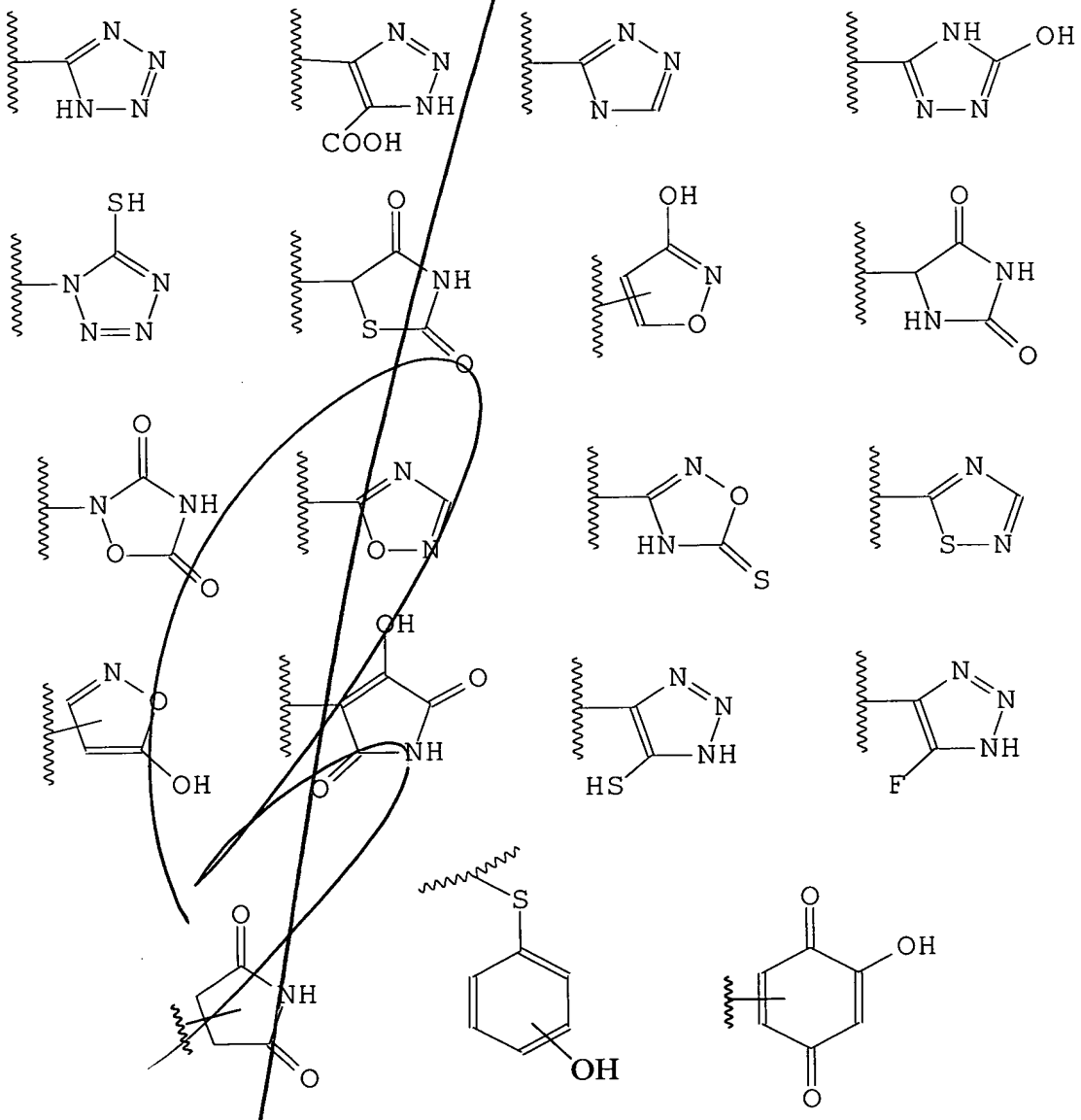
wherein said alkyl, alkenyl, alkynyl, aryl, heteroaryl, carbocycle, or heterocycle is optionally substituted with one or more substituents selected from R^3, where

R^3 is hydrogen, hydroxy, halo, haloalkyl, thiocarbonyl, alkoxy, alkenoxy, alkylaryloxy, aryloxy, arylalkyloxy, cyano, nitro, imino, alkylamino, aminoalkyl, sulfhydryl, thioalkyl, alkylthio, sulfonyl, C_1-C_6 straight or branched chain alkyl, C_2-C_6 straight or branched chain alkenyl or alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or CO_2R^4 where R^4 is hydrogen or C_1-C_9 straight or branched chain alkyl or alkenyl;

or a pharmaceutically acceptable salt, ester, or solvate thereof.

22. The method of claim 21, wherein R_2 is a carbocycle or heterocycle containing any combination of CH_2, O, S, or N in any chemically stable oxidation state, wherein any of the atoms of said ring structure are optionally substituted in one or more positions with R^3.

23. The method of claim 21, wherein R_2 is selected from the following group:



where the atoms of said ring structure may be optionally substituted at one or more positions with R^3.

24. The method of claim 21, wherein R_2 is selected from the group consisting of:
$-COOH$, $-SO_3H$, $-SO_2HNR^3$, $-PO_2(R^3)_2$, $-CN$, $-PO_3(R^3)_2$, $-OR^3$, $-SR^3$, $-NHCOR^3$, $-N(R^3)_2$, $-CON(R^3)_2$, $-CONH(O)R^3$, $-CONHNHSO_2R^3$, $-COHNSO_2R^3$, and $-CONR^3CN$.

25. The method of claim 14, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is selected from the group consisting of compounds 1-442, compound L, and compound M.

26. The method of claim 14, further comprising administering a neurotrophic factor different from formula (I).

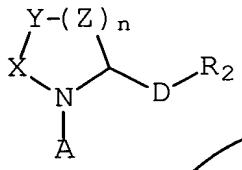
27. The method of claim 26, wherein said neurotrophic factor different from formula (I) is selected from the group consisting of neurotrophic growth factor, brain derived growth factor, glial derived growth factor, cilial neurotrophic factor, insulin growth factor and active truncated derivatives thereof, acidic fibroblast growth factor, basic fibroblast growth factor, platelet-derived growth factors, neurotropin-3, and neurotropin 4/5.

28. A method of stimulating growth of damaged peripheral nerves, comprising:

administering to damaged peripheral nerves an effective amount of a carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring to stimulate or promote growth of the damaged peripheral nerves.

29. The method of claim 28, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is non-immunosuppressive.

30. The method of claim 28, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring comprises a compound of formula (I):



(I)

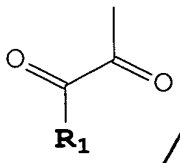
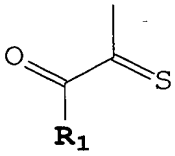
where

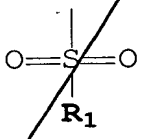
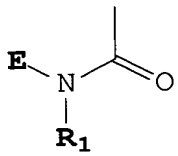
X, Y, and Z are independently selected from the group consisting of C, O, S, or N, provided that X, Y, and Z are not all C;

n is 1-3;

A is selected from the group consisting of L_1, L_2, L_3, or L_4,

where

L_1 is  , L_2 is  ,

L_3 is  , and L_4 is  ,

R_1 and E are independently selected from the group consisting of hydrogen, C_1-C_9 straight or branched chain alkyl or alkenyl, C_2-C_9 straight or branched chain alkenyl, aryl, heteroaryl, carbocycle, and heterocycle;

D is selected from the group consisting of a bond, C_1-C_{10} straight or branched chain alkyl, ethylene, and butylene;

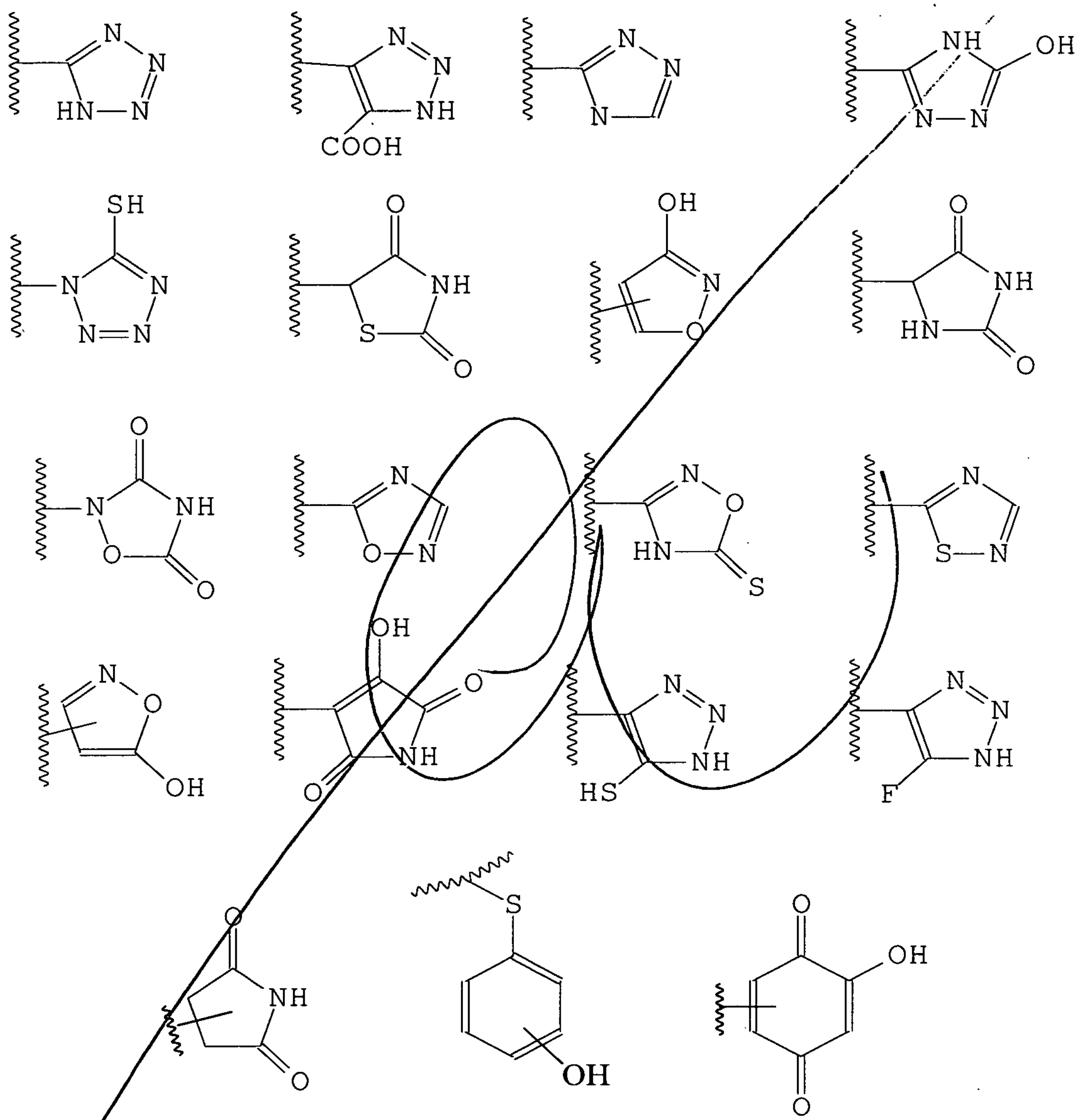
R_2 is a carboxylic acid or a carboxylic acid isostere; wherein said alkyl, alkenyl, alkynyl, aryl, heteroaryl, carbocycle, or heterocycle is optionally substituted with one or more substituents selected from R^3, where

R^3 is hydrogen, hydroxy, halo, haloalkyl, thiocarbonyl, alkoxy, alkenoxy, alkylaryloxy, aryloxy, arylalkyloxy, cyano, nitro, imino, alkylamino, aminoalkyl, sulfhydryl, thioalkyl, alkylthio, sulfonyl, C_1-C_6 straight or branched chain alkyl, C_2-C_6 straight or branched chain alkenyl or alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or CO_2R^4 where R^4 is hydrogen or C_1-C_9 straight or branched chain alkyl or alkenyl;

or a pharmaceutically acceptable salt, ester, or solvate thereof.

31. The method of claim 30, wherein R_2 is a carbocycle or heterocycle containing any combination of CH_2, O, S, or N in any chemically stable oxidation state, wherein any of the atoms of said ring structure are optionally substituted in one or more positions with R^3.

32. The method of claim 30, wherein R_2 is selected from the following group:



where the atoms of said ring structure may be optionally substituted at one or more positions with R^3.

33. The method of claim 30, wherein R_2 is selected from the group consisting of:
$-COOH$, $-SO_3H$, $-SO_2HNR^3$, $-PO_2(R^3)_2$, $-CN$, $-PO_3(R^3)_2$, $-OR^3$, $-SR^3$, $-NHCOR^3$, $-N(R^3)_2$, $-CON(R^3)_2$, $-CONH(O)R^3$, $-CONHNHSO_2R^3$, $-COHNSO_2R^3$, and $-CONR^3CN$.

34. The method of claim 28, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is selected from the group consisting of compounds 1-442, compound L, and compound M.

35. The method of claim 28, further comprising administering a neurotrophic factor different from formula (I).

36. The method of claim 35, wherein said neurotrophic factor different from formula (I) is selected from the group consisting of neurotrophic growth factor, brain derived growth factor, glial derived growth factor, cilial neurotrophic factor, insulin growth factor and active truncated derivatives thereof, acidic fibroblast growth factor, basic fibroblast growth factor, platelet-derived growth factors, neurotropin-3, and neurotropin 4/5.

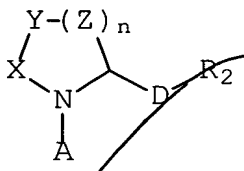
37. A method for promoting neuronal regeneration and growth in animals, comprising:

administering to an animal an effective amount of a carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring to promote neuronal regeneration.

38. The method of claim 37, wherein the carboxylic acid or

carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is non-immunosuppressive.

39. The method of claim 37, wherein the Carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring comprises a compound of formula (I):


(I)

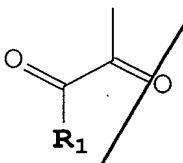
where

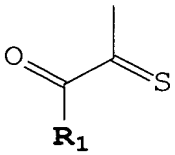
X, Y, and Z are independently selected from the group consisting of C, O, S, or N, provided that X, Y, and Z are not all C;

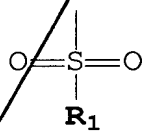
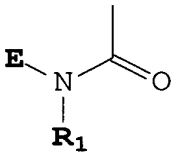
n is 1-3;

A is selected from the group consisting of L_1, L_2, L_3, or L_4,

where

L_1 is  ,

L_2 is  ,

L_3 is  , and L_4 is  ,

R_1 and E are independently selected from the group consisting of hydrogen, C_1-C_9 straight or branched chain alkyl or alkenyl, C_2-C_9 straight or branched chain alkenyl, aryl, heteroaryl, carbocycle, and heterocycle;

D is selected from the group consisting of a bond, C_1-C_{10} straight or branched chain alkyl, ethylene, and butylene;

R_2 is a carboxylic acid or a carboxylic acid isostere;

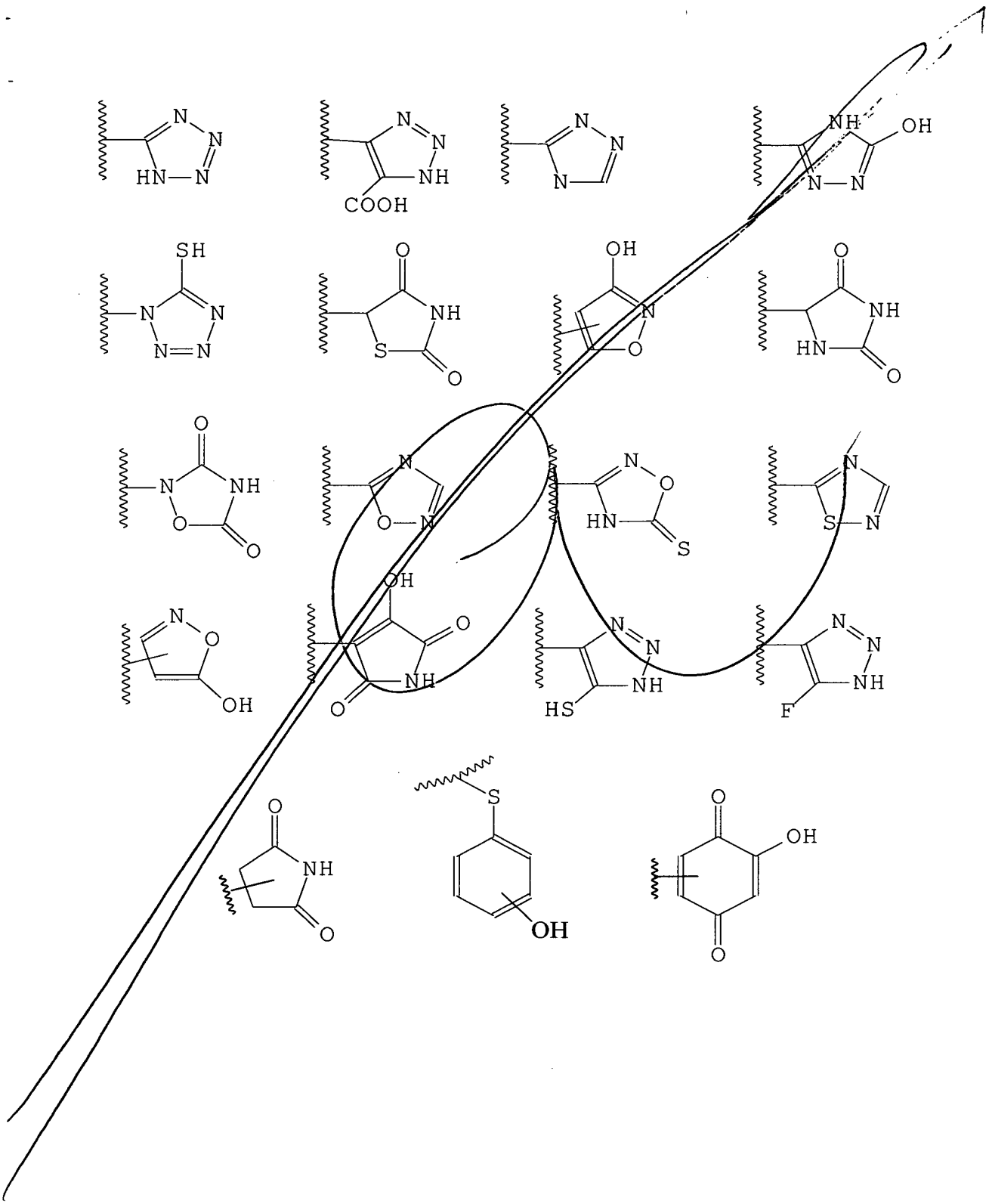
wherein said alkyl, alkenyl, alkynyl, aryl, heteroaryl, carbocycle, or heterocycle is optionally substituted with one or more substituents selected from R^3, where

R^3 is hydrogen, hydroxy, halo, haloalkyl, thiocarbonyl, alkoxy, alkenoxy, alkylaryloxy, aryloxy, arylalkyloxy, cyano, nitro, imino, alkylamino, aminoalkyl, sulfhydryl, thioalkyl, alkylthio, sulfonyl, C_1-C_6 straight or branched chain alkyl, C_2-C_6 straight or branched chain alkenyl or alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or CO_2R^4 where R^4 is hydrogen or C_1-C_9 straight or branched chain alkyl or alkenyl;

or a pharmaceutically acceptable salt, ester, or solvate thereof.

40. The method of claim 39, wherein R_2 is a carbocycle or heterocycle containing any combination of CH_2, O, S, or N in any chemically stable oxidation state, wherein any of the atoms of said ring structure are optionally substituted in one or more positions with R^3.

41. The method of claim 39, wherein R_2 is selected from the following group:



where the atoms of said ring structure may be optionally substituted at one or more positions with R^3.

42. The method of claim 39, wherein R_2 is selected from the group consisting of:
$-COOH$, $-SO_3H$, $-SO_2HNR^3$, $-PO_2(R^3)_2$, $-CN$, $-PO_3(R^3)_2$, $-OR^3$, $-SR^3$, $-NHCOR^3$, $-N(R^3)_2$, $-CON(R^3)_2$, $-CONH(O)R^3$, $-CONHNHSO_2R^3$, $-COHNSO_2R^3$, and $-CONR^3CN$.

43. The method of claim 37, wherein the N-heterocyclic carboxylic acid compound is selected from the group consisting of compounds 1-442, compound L, and compound M.

44. The method of claim 37, further comprising administering a neurotrophic factor different from formula (I).

45. The method of claim 44, wherein said neurotrophic factor different from formula (I) is selected from the group consisting of neurotrophic growth factor, brain derived growth factor, glial derived growth factor, cilial neurotrophic factor, insulin growth factor and active truncated derivatives thereof, acidic fibroblast growth factor, basic fibroblast growth factor, platelet-derived growth factors, neurotropin-3, and neurotropin 4/5.

46. A method for preventing neurodegeneration in an animal, comprising:

administering to an animal an effective amount of a carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring to prevent neurodegeneration.

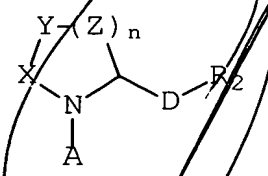
47. The method of claim 46, wherein the neurodegeneration is Alzheimer's disease.

48. The method of claim 46, wherein the neurodegeneration is Parkinson's disease.

49. The method of claim 46, wherein the neurodegeneration is amyotrophic lateral sclerosis.

50. The method of claim 46, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is non-immunosuppressive.

51. The method of claim 46, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring comprises a compound of formula (I):


(I)

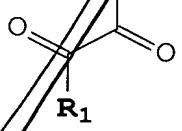
where

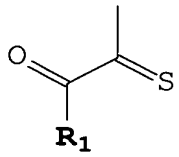
X, Y, and Z are independently selected from the group consisting of C, O, S, or N, provided that X, Y, and Z are not all C;

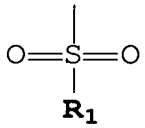
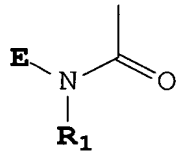
n is 1-3;

A is selected from the group consisting of L_1, L_2, L_3, or L_4,

where

L_1 is  ,

L_2 is  ,

L_3 is  , and L_4 is  ,

R_1 and E are independently selected from the group consisting of hydrogen, C_1-C_9 straight or branched chain alkyl or alkenyl, C_2-C_9 straight or branched chain alkenyl, aryl, heteroaryl, carbocycle, and heterocycle;

D is selected from the group consisting of a bond, C_1-C_{10} straight or branched chain alkyl, ethylene, and butylene;

R_2 is a carboxylic acid or a carboxylic acid isostere;

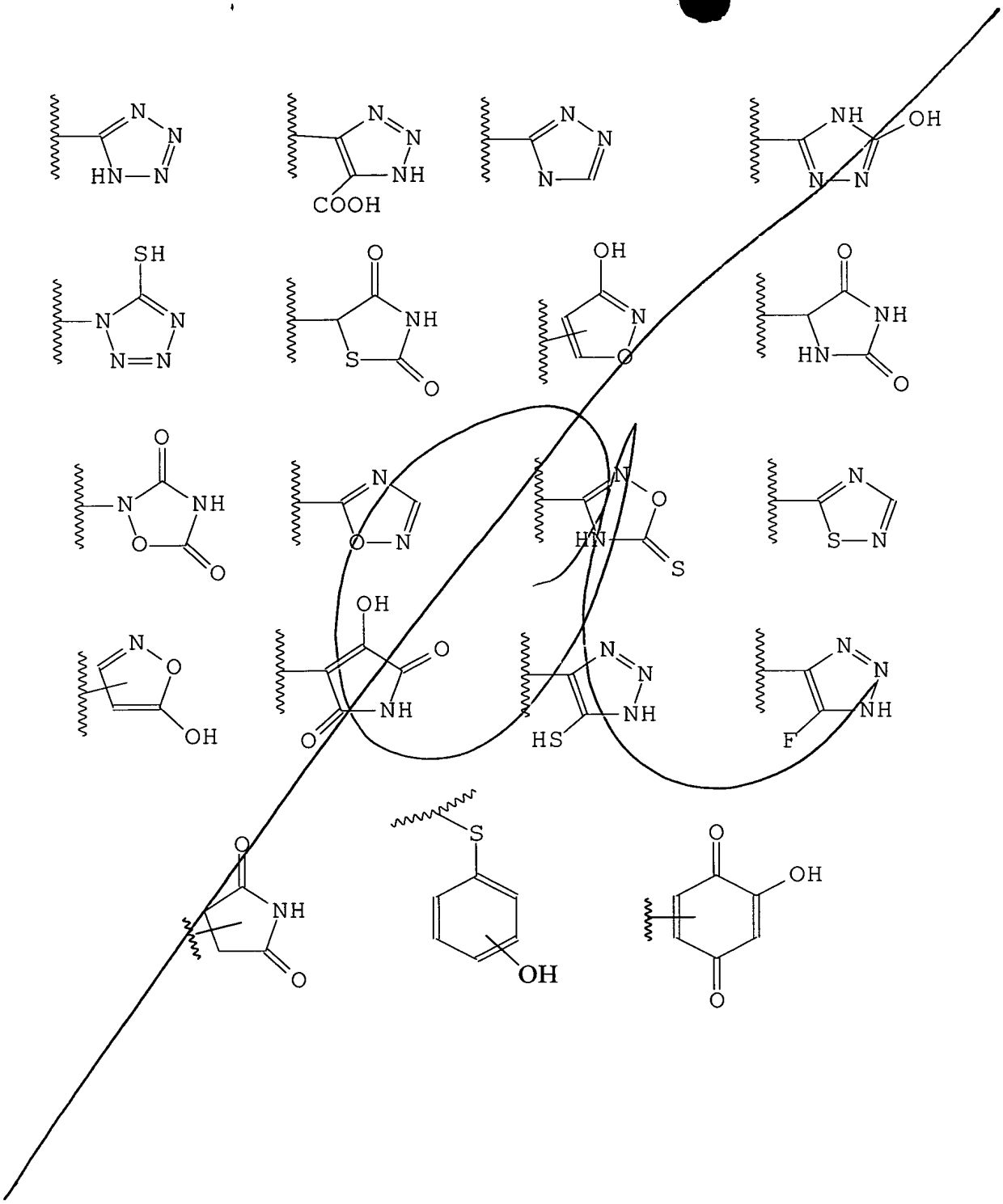
wherein said alkyl, alkenyl, alkynyl, aryl, heteroaryl, carbocycle, or heterocycle is optionally substituted with one or more substituents selected from R^3, where

R^3 is hydrogen, hydroxy, halo, haloalkyl, thiocarbonyl, alkoxy, alkenoxy, alkylaryloxy, aryloxy, arylalkyloxy, cyano, nitro, imino, alkylamino, aminoalkyl, sulfhydryl, thioalkyl, alkylthio, sulfonyl, C_1-C_6 straight or branched chain alkyl, C_2-C_6 straight or branched chain alkenyl or alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or CO_2R^4 where R^4 is hydrogen or C_1-C_9 straight or branched chain alkyl or alkenyl;

or a pharmaceutically acceptable salt, ester, or solvate thereof.

52. The method of claim 51, wherein R_2 is a carbocycle or heterocycle containing any combination of CH_2, O, S, or N in any chemically stable oxidation state, wherein any of the atoms of said ring structure are optionally substituted in one or more positions with R^3.

53. The method of claim 51, wherein R_2 is selected from the following group:



where the atoms of said ring structure may be optionally substituted at one or more positions with R^3.

54. The method of claim 51, wherein R_2 is selected from the group consisting of:
$-COOH$, $-SO_3H$, $-SO_2HNR^3$, $-PO_2(R^3)_2$, $-CN$, $-PO_3(R^3)_2$, $-OR^3$, $-SR^3$, $-NHCOR^3$, $-N(R^3)_2$, $-CON(R^3)_2$, $-CONH(O)R^3$, $-CONHNHSO_2R^3$, $-COHNSO_2R^3$, and $-CONR^3CN$.

55. The method of claim 46, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is selected from the group consisting of compounds 1-442, compound L, and compound M.

56. The method of claim 46, further comprising administering a neurotrophic factor different from formula (I).

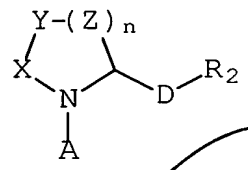
57. The method of claim 56, wherein said neurotrophic factor different from formula (I) is selected from the group consisting of neurotrophic growth factor, brain derived growth factor, glial derived growth factor, cilial neurotrophic factor, insulin growth factor and active truncated derivatives thereof, acidic fibroblast growth factor, basic fibroblast growth factor, platelet-derived growth factors, neurotropin-3, and neurotropin 4/5.

58. A method for treating alopecia or promoting hair growth in an animal, which comprises administering to said animal an effective amount of a carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring.

59. The method of claim 58, wherein the carboxylic acid or

carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is non-immunosuppressive.

60. The method of claim 58, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is a compound of formula (I):


(I)

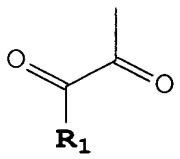
where

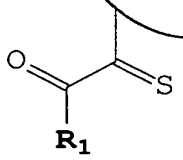
X, Y, and Z are independently selected from the group consisting of C, O, S, or N, provided that X, Y, and Z are not all C;

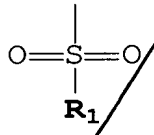
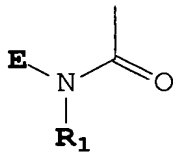
n is 1-3;

A is selected from the group consisting of L_1, L_2, L_3, or L_4,

where

L_1 is  ,

L_2 is  ,

L_3 is  , and L_4 is  ,

R_1 and E are independently selected from the group consisting of hydrogen, C_1-C_9 straight or branched chain alkyl or alkenyl, C_2-C_9 straight or branched chain alkenyl, aryl, heteroaryl, carbocycle, and heterocycle;

D is selected from the group consisting of a bond, C_1-C_{10} straight or branched chain alkyl, ethylene, and butylene;

R_2 is a carboxylic acid or a carboxylic acid isostere;

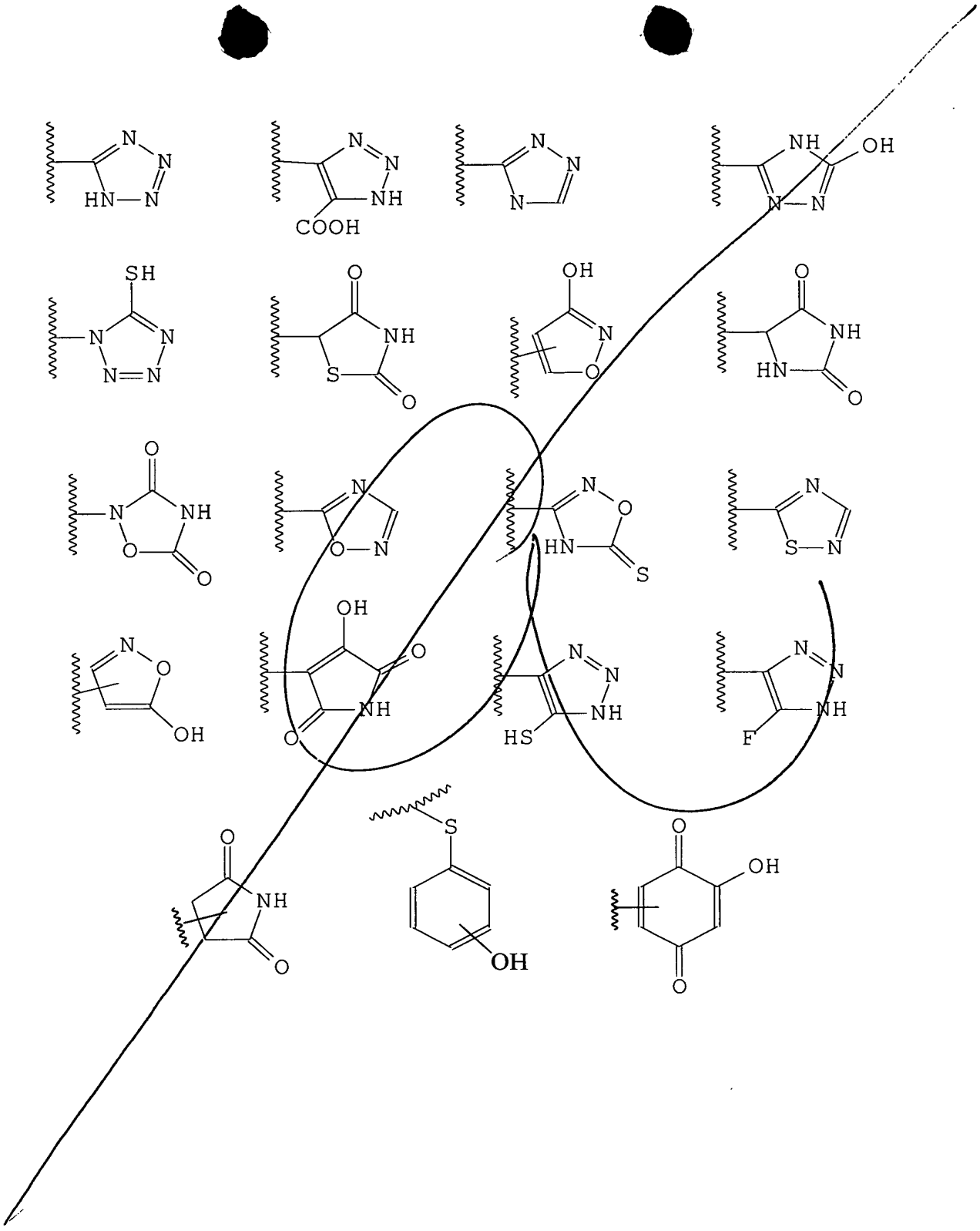
wherein said alkyl, alkenyl, alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or carboxylic acid isostere is optionally substituted with one or more substituents selected from R^3, where

R^3 is hydrogen, hydroxy, halo, haloalkyl, thiocarbonyl, alkoxy, alkenoxy, alkylaryloxy, aryloxy, arylalkyloxy, cyano, nitro, imino, alkylamino, aminoalkyl, sulfhydryl, thioalkyl, alkylthio, sulfonyl, C_1-C_6 straight or branched chain alkyl, C_2-C_6 straight or branched chain alkenyl or alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or CO_2R^4 where R^4 is hydrogen or C_1-C_9 straight or branched chain alkyl or alkenyl;

or a pharmaceutically acceptable salt, ester, or solvate thereof.

61. The method of claim 60, wherein R_2 is a carbocycle or heterocycle containing any combination of CH_2, O, S, or N in any chemically stable oxidation state, wherein any of the atoms of said ring structure are optionally substituted in one or more positions with R^3.

62. The method of claim 60, wherein R_2 is selected from the following group:



where the atoms of said ring structure may be optionally substituted at one or more positions with R^3.

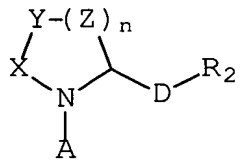
63. The method of claim 60, wherein R_2 is selected from the group consisting of
$-COOH$, $-SO_3H$, $-SO_2HNR^3$, $-PO_2(R^3)_2$, $-CN$, $-PO_3(R^3)_2$, $-OR^3$, $-SR^3$, $-NHCOR^3$, $-N(R^3)_2$, $-CON(R^3)_2$, $-CONH(O)R^3$, $-CONHNHSO_2R^3$, $-COHNSO_2R^3$, and $-CONR^3CN$.

64. The method of claim 58, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is selected from the group consisting of compounds 1-442, compound L, and compound M.

65. A pharmaceutical composition comprising:
(i) an effective amount of a carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring for treating alopecia or promoting hair growth in an animal; and
(ii) a pharmaceutically acceptable carrier.

66. The pharmaceutical composition of claim 65, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is non-immunosuppressive.

67. The composition of claim 65, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is a compound of formula (I):



(I)

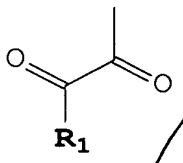
where

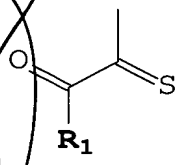
X, Y, and Z are independently selected from the group consisting of C, O, S, or N, provided that X, Y, and Z are not all C;

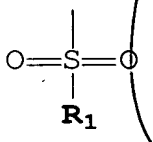
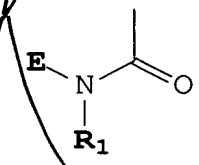
n is 1-3;

A is selected from the group consisting of L_1, L_2, L_3, or L_4,

where

L_1 is  ,

L_2 is  ,

L_3 is  , and L_4 is  ,

R_1 and E are independently selected from the group consisting of hydrogen, C_1-C_9 straight or branched chain alkyl or alkenyl, C_2-C_9 straight or branched chain alkenyl, aryl, heteroaryl, carbocycle, and heterocycle;

D is selected from the group consisting of a bond, C_1-C_{10} straight or branched chain alkyl, ethylene, and butylene;

R_2 is a carboxylic acid or a carboxylic acid isostere;

wherein said alkyl, alkenyl, alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or carboxylic acid isostere is optionally substituted with one or more substituents selected from R^3, where

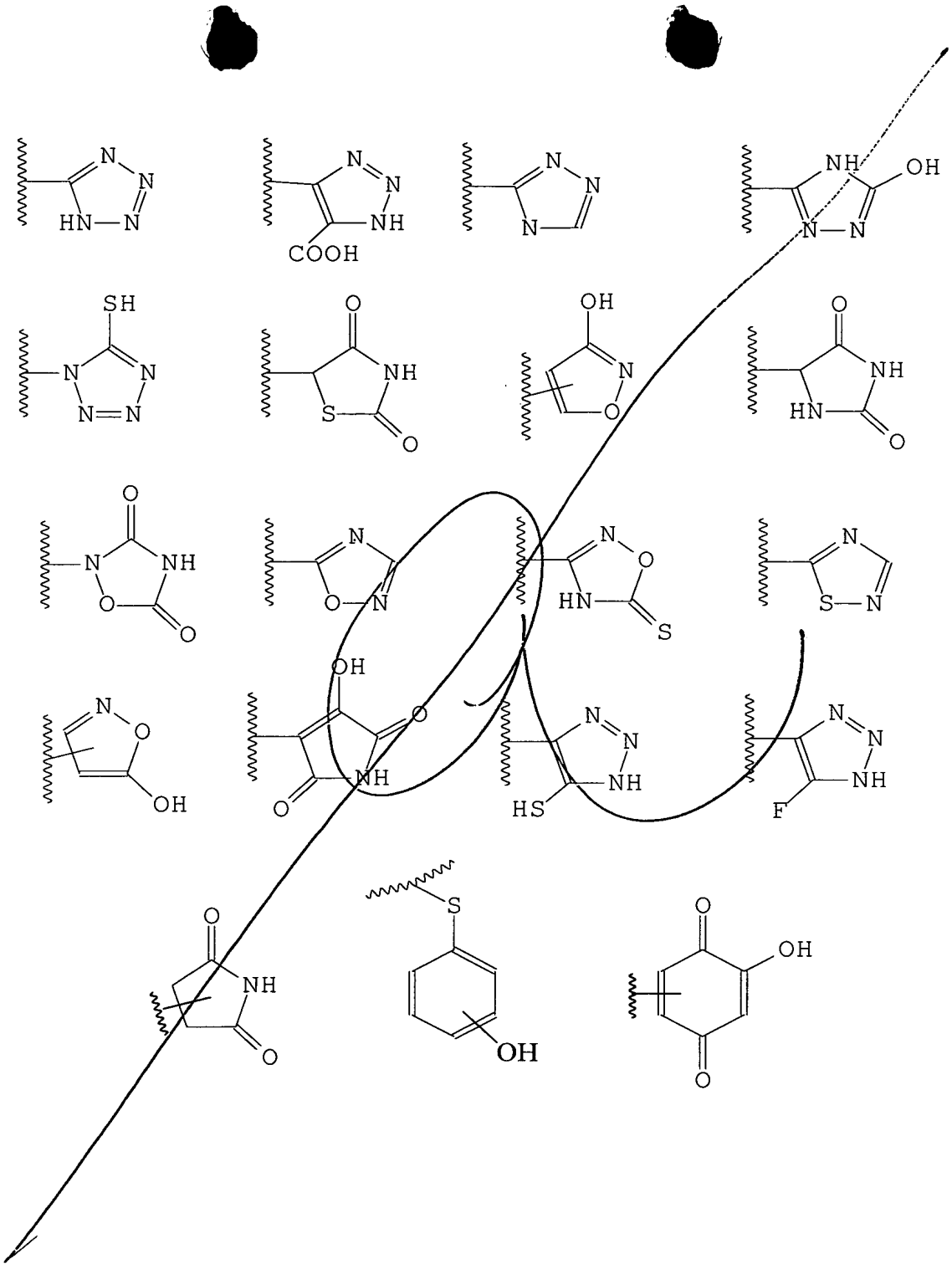
R^3 is hydrogen, hydroxy, halo, haloalkyl, thiocarbonyl, alkoxy, alkenoxy, alkylaryloxy, aryloxy, arylalkyloxy, cyano, nitro, imino, alkylamino, aminoalkyl, sulfhydryl, thioalkyl, alkylthio, sulfonyl, C_1-C_6 straight or branched chain alkyl,

C_2-C_6 straight or branched chain alkenyl or alkynyl, aryl, heteroaryl, carbocycle, heterocycle, or CO_2R^4 where R^4 is hydrogen or C_1-C_9 straight or branched chain alkyl or alkenyl;

or a pharmaceutically acceptable salt, ester, or solvate thereof.

68. The composition of claim 67, wherein R_2 is a carbocycle or heterocycle containing any combination of CH_2, O, S, or N in any chemically stable oxidation state, wherein any of the atoms of said ring structure are optionally substituted in one or more positions with R^3.

69. The composition of claim 67, wherein R_2 is selected from the following group:



where the atoms of said ring structure may be optionally substituted at one or more positions with R^3.

70. The composition of claim 67, wherein R_2 is selected from the group consisting of:
$-COOH$, $-SO_3H$, $-SO_2HNR^3$, $-PO_2(R^3)_2$, $-CN$, $-PO_3(R^3)_2$, $-OR^3$, $-SR^3$, $-NHCOR^3$, $-N(R^3)_2$, $-CON(R^3)_2$, $-CONH(O)R^3$, $-CONHNHSO_2R^3$, $-COHNSO_2R^3$, and $-CONR^3CN$.

71. The composition of claim 65, wherein the carboxylic acid or carboxylic acid isostere of an N-heterocyclic ring compound having two or more heteroatoms in the ring is selected from the group consisting of compounds 1-442, compound L, and compound M.

add a7